1. What is the magnification of a telescope that has an objective with twice the focal length of its eyepiece?

2. The observing cage in which an astronomer sits at the prime focus of the 5-m telescope on Palomar Mountain is about 1 meter in diameter. Calculate what fraction of the incoming starlight is blocked by the cage.

3. How does the light-gathering power of a 300-m diameter radio telescope compare to that of a 50-m diameter radio telescope?

4. How much larger than a 1-m telescope would another telescope have to be in order to have 1000 times the light-gathering power?

5. (a) Compare the light-gathering power of the Subaru 8.3-m telescope with that of the Hubble Space Telescope (HST), which has a 2.4-m objective mirror. (b) What advantages does Subaru have over HST? What advantages does HST have over Subaru?

6. Suppose your Newtonian reflector has an objective mirror 20 cm in diameter with a focal length of 2 meters. What magnification do you get with eyepieces whose focal lengths are (a) 9 mm, (b) 20 mm, (c) 55 mm? (d) What is the telescope’s angular resolution when used with orange light of wavelength 600 nm?

7. The four largest moons of Jupiter are roughly the same size as our Moon and are about 628 million (6.28 x 10^8) kilometers from Earth at their nearest. What is the size in kilometers of the smallest surface that the Hubble Space Telescope (resolution of 0.1 arcsec) can detect? How does this compare with the smallest features that can be seen on the Moon with the unaided human eye (resolution of 1 arcmin)?

8. The Hubble Space Telescope (HST) has been used to observe the galaxy M100, some 70 million light-years from Earth. (a) If the angular resolution of the HST image is 0.1 arcsec, what is the diameter in light-years of the smallest detail that can be discerned in the image? (b) At what distance would a U.S. dime (diameter 1.8 cm) have an angular size 0.1 arcsec? Give you answer in kilometers.

9. A 4-m optical telescope operates at a wavelength of $5 \times 10^{-7}$ m. How large would an infrared telescope operating at a wavelength of $10^{-4}$ m have to be to have the same resolution as the optical telescope?

10. About how large would an optical telescope operating at 550 nm need to be to achieve the angular resolution of the Very Large Baseline Array radio telescopes (0.001 arcsec)?